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| 10/809,979 | 03/26/2004 | Mark E. Thompson | 12992/90701 | 9637 |

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| EXAMINER | |
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| HALL, ASHA J | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/809,979 | THOMPSON ET AL. | |
| | Examiner | Art Unit | |
| | Asha Hall | 1795 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-12, 14-15, and 17-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Lamansky et al. (WO 02/15645).

As to claim 1, Lamansky et al. disclose an organic photosensitive optoelectronic device (Organic light emitting devices (OLEDs): see page 7, lines 10-20) along with a series of organometallic compounds (see page 7, lines 10-11) that are meant to be used in these devices in order to improve their electrophosphorescence (column 4, lines 19-22). As is known to one of ordinary skill in the art, an OLED comprises: an anode, an active region; and a cathode. The invention of Lamansky et al. refers specifically to OLEDs in which the active layer is composed of the "phosphorescent organic compound" (page 7, lines 10-11) that is created when the ligands of Figures 5a-5d are combined with the ligands of Figures 6a-6c and a "heavy transition metal such as Ir" (page 13, line 20) as describe on pages 13 lines 19-23 and page 14 lines 1-5. As can be seen from Figures 5a-5d and 6a-6c, several of these materials (e.g., the one that

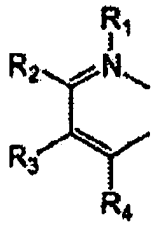
results from combination of the leftmost ligand of the top row of Figure 5a or the right most ligand in the top row of Figure 5d with the ligands of Figure 6c and Ir, etc.) are cyclometalled organometallic compounds. Although the OLED as described in Lamansky et al. to as a "light emitting device" rather than one that specifically produces a photogenerated current when illuminated with light, the latter is an inherent property of the emissive layer formed as described on pages 13 lines 19-23 and page 14 lines 1-5.

Lamansky further discloses active region include the electron withdrawing groups/acceptors which remove electrons from the donor/highest occupied molecular orbitals (HOMO) (page 15; lines: 202-25 and page 19; lines: 14-20) which consists of the cyclometallated (page 15; lines: 7-15) organometallic material/ligand and metal atom (page 19; lines: 20-21). The highest occupied molecular orbital (HOMO) is the donor orbital as evidence given by Wypych, (**Handbook of Solvents**, ChemTee Publishing copyright 2001, Toronto-New York, p.572-572). Lamansky discloses a guest-host system (page 13; lines1-3) such that the host is doped with a guest material phosphor (page 38; lines: 9-13).

As to claim 2, Lamansky et al. state on page 13, line 2 that their cyclometalled organic compound may contain a heavy transition metal such as Ir and list several other "preferred metals" for the invention including Pt on page 16, lines 1-5.

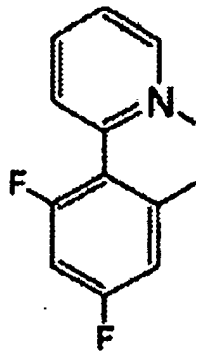
As to claim 3, Lamansky et al. discloses that the device includes a blocking layer (page 60, 13-15).

As to claim 4, the structure of this claim is obtained by combining the leftmost ligand of the top row of Figure 5a of Lamansky et al.:

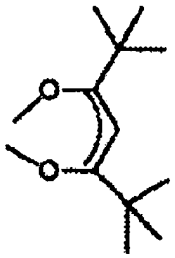



with any of the ligands in Figure 6c and using a transition metal such as Pt or Ir (page 16, lines 1-5), as instructed by Lamansky et al. on pages 13 lines 19-23 and page 14 lines 1-5. This corresponds to the following values of the parameters listed in Formula (I) of claim 4: M is a transition metal having atomic weight greater than 40 (i.e., Pt or Ir); Z is C (as shown above); the dotted line of Formula (I) is a double bond (as shown above); $R^1$-$R^4$ are independently selected from hydrogen, alkyl or aryl (as instructed in the caption of Figure 5a of Lamansky et al.); (X and Y) are ancillary ligands from Figure 6c (e.g., the leftmost ligands of the top two rows); a is one; b is one; and the sum of and b is two.

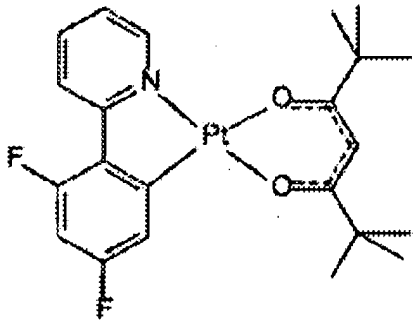
As to claims 5-9 and 11, several of the cyclometalled organometallic compounds of Lamansky et al. formed as described on pages 13 lines 19-23 and page 14 lines 1-5 have the structure recited in this claim. For example, the combination of the rightmost ligand in the top row of Figure 5d:




with the leftmost ligand of the second row from top in Figure 6c:

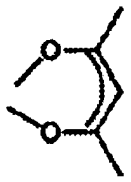



and using a transition metal such as Pt (page 16, lines 1-5), as instructed by Lamansky et al. on pages 13 lines 19-23 and page 14 lines 1-5. This creates the structure of the compound (4',6'-$F_2$PPY)Pt(dpm):

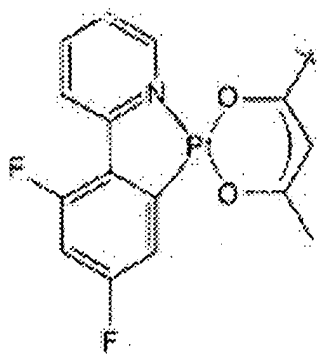


and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no $R^5$ values (i.e., n = 0); there are two $R^6$ values (i.e., m = 2, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from second to top two row of Figure 6c (as shown above); a is one; b is one; and the sum of and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will read on claims 5-8. Note further, that the structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

Another example of a cyclometalled organometallic compounds of Lamansky et al. that reads on claims 5-9 is found by the combination of the rightmost ligand in the top row of Figure 5d (above) with the with the leftmost ligand of the top row of in Figure 6c:



and using a transition metal such as Pt (page 16, lines 1-5), as instructed by Lamansky et al. on pages 13 lines 19-23 and page 14 lines 1-5. This creates the structure of the compound (4,6-$F_2$PPY)Pt(acac):



and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no $R^5$ values (i.e., n = 0); there are two $R^6$ values (i.e., m = 2, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from the top row of Figure 6c (as shown above); a is one; b is one; and the sum of and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will meet the structural limitations of claims 5-8. Note further, that the structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

As to claim 10, it is an inherent property of (4',6'-$F_2$ppy)Pt(dpm) (i.e., the cyclometallated organometallic compound from Lamansky et al. applied to claim 7 above) to form π-stacked chains. This is reflected in the specification of the instant application in Figure 6. See MPEP 2112 for a discussion of the inherency in regard to chemical structures and their properties.

As to claim 12, it is an inherent property of the cyclometallated organometallic material to absorb light in the near IR portion of the spectrum. For example, see Figure 5 of Lamansky et al. (US Patent 6,911,271) of (4,6-$F_2$PPY)Pt(acac) (the second compound discussed above in the context of claims 5-9).

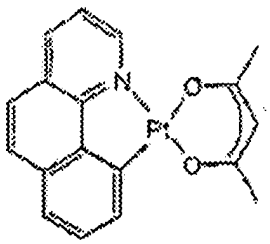
In regard to claim 14, Lamansky discloses an organic photosensitive optoelectronic device of claim 1, wherein the device is a photodetector (page 61, lines10-13).

As to claim 15, Lamansky discloses the organic photosensitive optoelectronic device of claim 1, wherein the device is a photoconductor (page 5; lines:19-21). Lamansky discloses that the molecules in the organic light emitting diode emit light (photons) when excited by current (i.e. phosphorescence) such materials are hole conductors and electron transporters (page 60 lines: 9-13), which defines photoconductivity within the device.

With regard to claim 17, Lamansky discloses a photosensitive optoelectronic device of claim 1, and further discloses a guest-host system (page 13; lines1-3) such that the host is doped with a guest material phosphor (page 38; lines: 9-13).

With regard to claims 18 and 19, Lamansky discloses the organic photosensitive optoelectronic device of claims 4 and 5 respectively, wherein M a transition metal selected from the group consisting of Pt, Ir, Au, Os, and Ag (page 6; lines: 1-5.).

In regard to claim 20, Lamansky discloses organic photosensitive optoelectronic device of claim 4, wherein the cyclometallated organometallic material comprises a partial structure selected from the group consisting of structures (d) shown in Figure 9C:

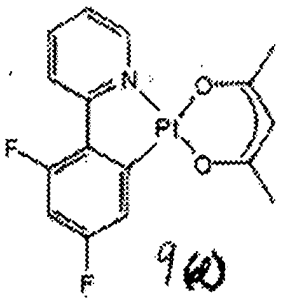



9(c)

(bzq)Pt(acac)

With regard to claim 21, Lamansky discloses the organic photosensitive optoelectronic device of claim 20, wherein M a transition metal selected from the group consisting of Pt, Ir (page 6; lines: 1-5).

With regard to claim 22, Lamansky discloses the organic photosensitive optoelectronic device of claim 5, wherein the cyclometallated organometallic material is selected from the group consisting of the following compounds (Figure 9d):




90

$(4,6\text{-}F_2ppy)Pt(acac)$

3. Claims 1, 2, 4, 5-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Lamansky et al. (US Patent 6,939,624).

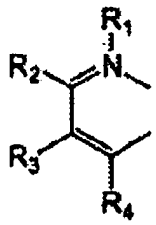
The applied reference has two common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

As to claim 1, Lamansky et al. disclose an organic photosensitive optoelectronic device (Organic light emitting devices (OLEDs): see column 20, lines 22-45 which discuss the fabrication and testing of these devices) along with a series of organometallic compounds (Figures 5 and 6) that are meant to be used in these devices in order to improve their electrophosphorescence (column 4, lines 19-22). As is known to one of ordinary skill in the art, an OLED comprises: an anode, an active region; and a

cathode. The invention of Lamansky et al. refers specifically to OLEDs in which the active layer is composed of the "phosphorescent organic compound" (column 9 line 59) that is created when the ligands of Figures 5a-5d are combined with the ligands of Figures 6a-6c and a "heavy transition metal such as Ir" (column 9, line 51). As can be seen from those figures, several of these materials (e.g., the one that results from combination of the leftmost ligand of the top row of Figure 5a or the right most ligand in the top row of Figure 5d with the ligands of Figure 6c and Ir, etc.) are cyclometalled organometallic compounds. Although the OLED as described in Lamansky et al. to as a "light emitting device" rather than one that specifically produces a photogenerated current when illuminated with light, the latter is an inherent property of the emissive layer formed as described in column 9 lines 54-61.

As to claim 2, Lamansky et al. state in column 9, line 51 that their cyclometalled organic compound may contain a heavy transition metal such as Ir and list several other "preferred metals" for the invention including Pt in column 7 lines 46-52.

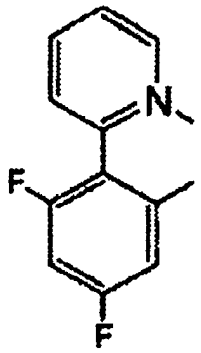
As to claim 4, the structure of this claim is obtained by combining the leftmost ligand of the top row of Figure 5a of Lamansky et al.:



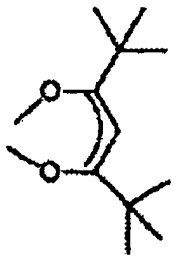

with any of the ligands in Figure 6c and using a transition metal such as Pt or Ir (column 7 lines 46-52), as instructed by Lamansky et al. in column 9 lines 54-61. This

corresponds to the following values of the parameters listed in Formula (I) of claim 4: M is a transition metal having atomic weight greater than 40 (i.e., Pt or Ir); Z is C (as shown above); the dotted line of Formula (I) is a double bond (as shown above); $R^1$-$R^4$ are independently selected from hydrogen, alkyl or aryl (as instructed in the caption of Figure 5a of Lamansky et al.); (X and Y) are ancillary ligands from Figure 6c (e.g., the leftmost ligands of the top two rows); a is one; b is one; and the sum of and b is two.

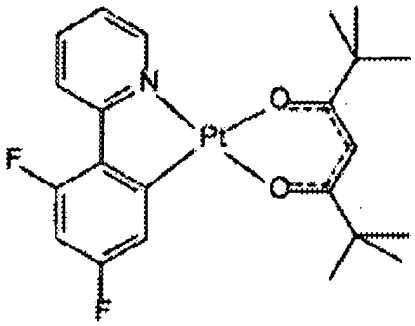
As to claims 5-9 and 11, several of the cyclometalled organometallic compounds of Lamansky et al. formed as described in column 9, lines 54-62 have the structure recited in this claim. For example, the combination of the rightmost ligand in the top row of Figure 5d:




with the leftmost ligand of the second row from top in Figure 6c:

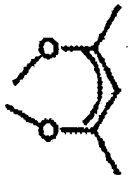


and using a transition metal such as Pt(column 7 lines 46-52), as instructed by Lamansky et al. in column 9 lines 54-61. This creates the structure of the compound (4',6'-$F_2$PPY)Pt(dpm):

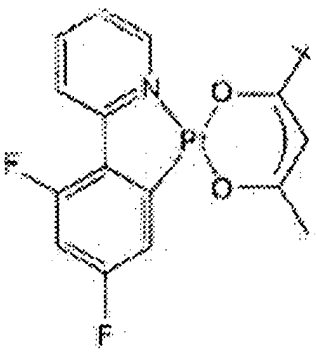



and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no $R^5$ values (i.e., n = 0); there are two $R^6$ values (i.e., m = 2, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from second to top two row of Figure 6c (as shown above); a is one; b is one; and the sum of and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will read on claims 5-8. Note further, that the structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

Another example of a cyclometalled organometallic compounds of Lamansky et al. that reads on claims 5-9 is found by the combination of the rightmost ligand in the top row of Figure 5d (above) with the with the leftmost ligand of the top row of in Figure 6c:



and using a transition metal such as Pt(column 7 lines 46-52), as instructed by Lamansky et al. in column 9 lines 54-61. This creates the structure of the compound(4,6-$F_2$PPY)Pt(acac):



and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no $R^5$ values (i.e., n = 0); there are two $R^6$ values (i.e., m = 2, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from the top row of Figure 6c (as shown above); a is one; b is one; and the sum of and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will meet the structural limitations of claims 5-8. Note further, that the structure, formed as instructed

by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

As to claim 10, it is an inherent property of (4',6'-$F_2$ppy)Pt(dpm) (i.e., the cyclometallated organometallic compound from Lamansky et al. applied to claim 7 above) to form π-stacked chains. This is reflected in the specification of the instant application in Figure 6. See MPEP 2112 for a discussion of the inherency in regard to chemical structures and their properties.

As to claim 12, it is an inherent property of the cyclometallated organometallic material to absorb light in the near IR portion of the spectrum. For example, see Figure 5 of Lamansky et al. (US Patent 6,911,271) of (4,6-$F_2$PPY)Pt(acac) (the second compound discussed above in the context of claims 5-9).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 13 and 16 are rejected under 35 U.S.C. 103(a) as being anticipated by Lamansky et al. (WO 02/15645) as applied to claim 1 above, and in further view of Okada et al. (US Patent 7,189,917)

As to claims 13 and16, Lamansky et al. disclose an organic photosensitive optoelectronic device (Organic light emitting devices (OLEDs): see page 7, lines 10-20)

along with a series of organometallic compounds (see page 7, lines 10-11), but fail to disclose that the device may be a photovoltaic device that contain multiple subcells in series.

Okada et al. show a stacked photovoltaic element (stacked photovoltaic device, 300, depicted in Figure 1) comprising a plurality of unit photovoltaic elements (first photovoltaic device, 305, second photovoltaic device, 303) each composed of a pin-junction (Okada et al. explain that 305 may be a "pin junction" in line 13 of column 6 and that 303 may be a "pin junction" in line 22 of column 5), connected to each other in series (as shown in Figure 1). As Okada et al. explain in column 1 lines 20-22, the use of a stacked photovoltaic device with multiple subcells connected in series allows the device to absorb a wider wavelength region of light. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the stacked configuration of Okada et al. with the organic solar cell layers of Thompson as multiple subcells in order to absorb a wider wavelength region of light.

## ***Response to Arguments***

Specification

1. Due to Applicant's amendments, the objection to the specification is withdrawn.

Claim Rejections under 35 U.S.C. 112 second paragraph

2. Due to the Applicant's amendments, the 35 U.S.C. 112 second paragraph rejection for claims 4-11 are withdrawn.

Claim Rejections under 35 U.S.C. 102(b)

3. In regard to claim 1, the Applicant argues that Lamansky does not explicitly state that the cyclometallated phosphorescent organometallic compound is used only as a dopant or guest compound in the active region of the OLEDs, all the specific embodiments of the OLEDs disclosed in Lamansky have the active region comprising the cyclometallated phosphorescent organometallic compound as a dopant or guest compound. Due to the Applicant's amendments to claim 1, see the new grounds of rejection presented above.

4. The Applicant argues that the work described in Knowles et al. was made by, or on behalf of, and/or in connection with one or more of the following parties to a joint university corporation research agreement: Princeton University, The University of Southern California and the Universal Display Corporation, which is the same joint university corporation research agreement under which the claimed invention was made. As a result, Knowles et al. is not prior art against the claimed invention under 35 U.S.C. 103(c).

5. The Applicant's arguments have been fully considered and are persuasive. The 35 U.S.C. 103 (a) of Knowles et al. (US 2005/0164030) has been withdrawn, see new grounds of rejection as presented above.

6. The Applicant argues that the work described in Thompson was made by, or on behalf of, and/or in connection with one or more of the following parties to a joint

university corporation research agreement: Princeton University, The University of Southern California and the Universal Display Corporation, which is the same joint university corporation research agreement under which the claimed invention was made. As a result, Thompson is not prior art against the claimed invention under 35 U.S.C. 103(c).

The Applicant's arguments have been fully considered and are persuasive. The 35 U.S.C. 103 (a) of Thompson (US 7,011,897) has been withdrawn, see new grounds of rejection as presented above.

***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Asha Hall whose telephone number is 571-272-9812. The examiner can normally be reached on Monday-Thursday 8:30-7:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AJH

ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER